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(54) Measuring device in a spinning preparation machine

(57) In a spinning preparation machine, such as a carding machine, a cleaner or the like, in which a clothed cylinder 4 cooperates with a counter-surface, for example a card top, there is at least one sensor 17 with which the tip clearance between the clothed cylinder 4 and the counter-surface can be detected. The sensor 17 may be associated with a card top which lies opposite the clothing of the cylinder 4. It may have a fixed position or, as a card top bar 14n, may be part of a revolving card top. The sensor 17 may be an inductive sensor and may be connected to a control system for effecting adjustment of the clearance.

FIG. 2

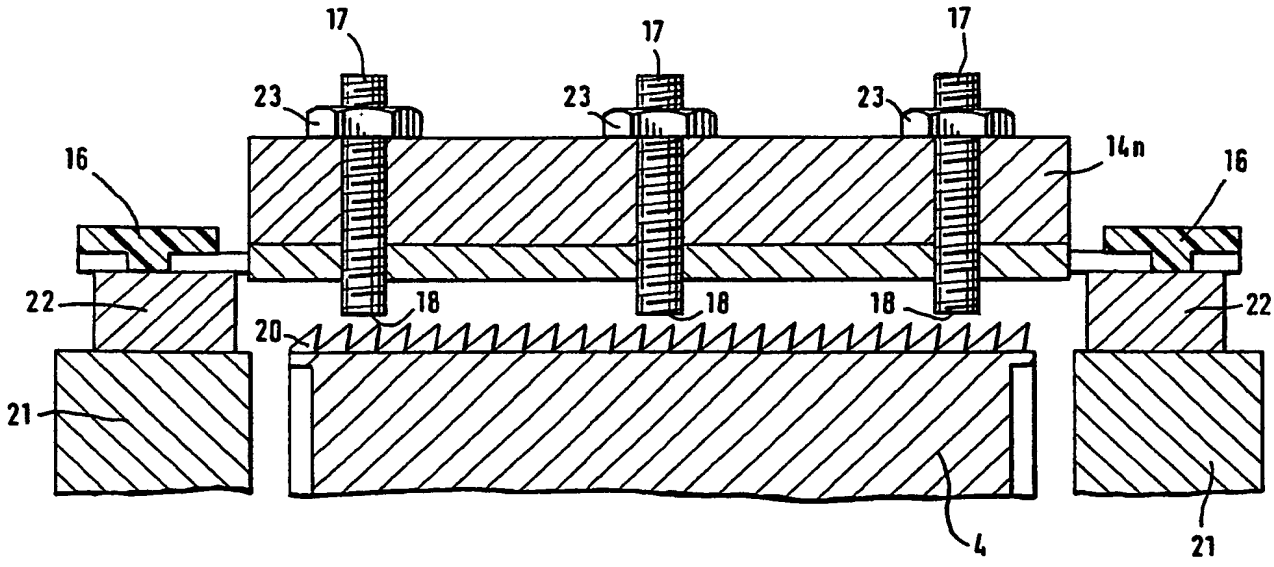

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FIG.1

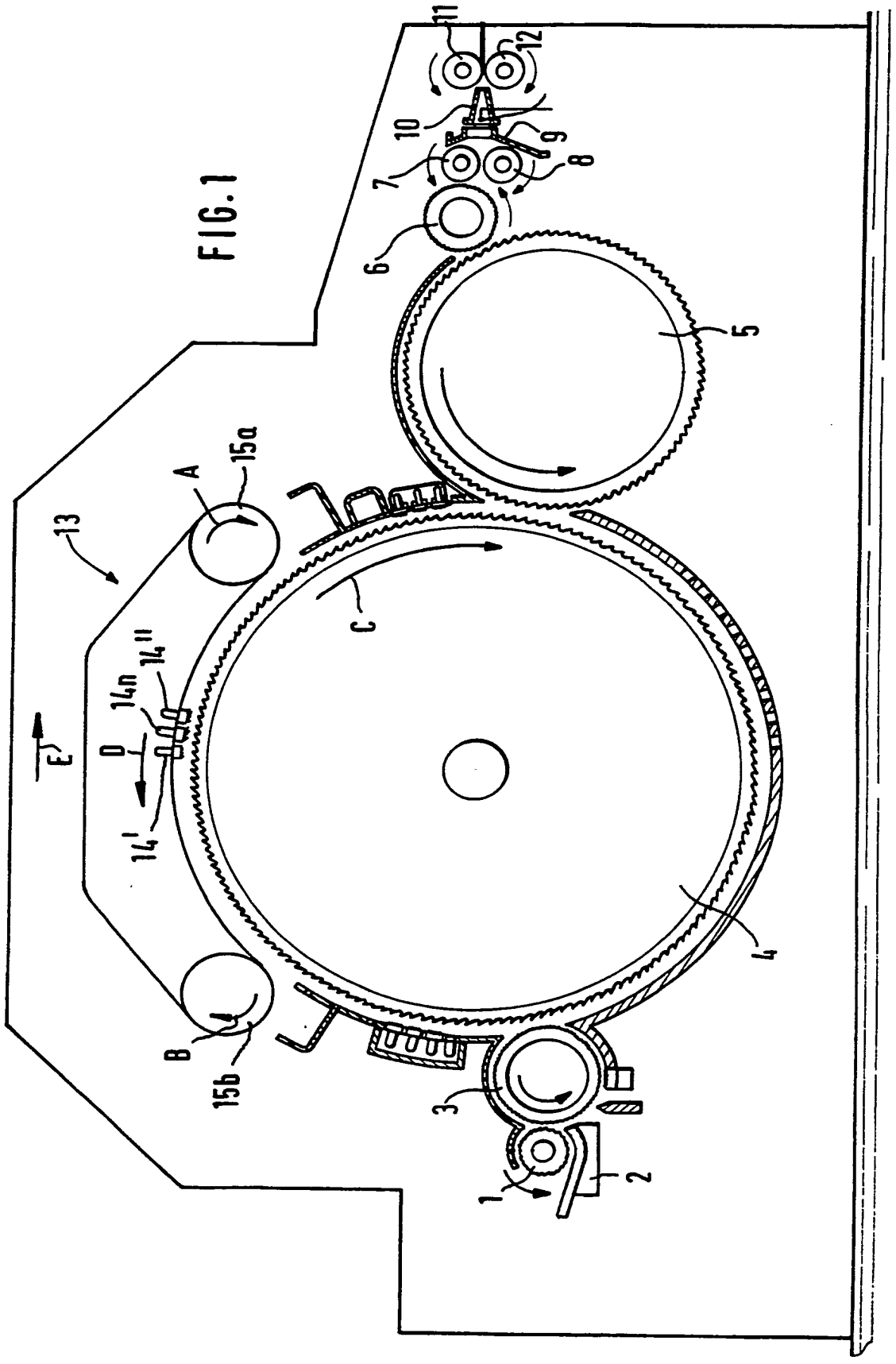


FIG. 2

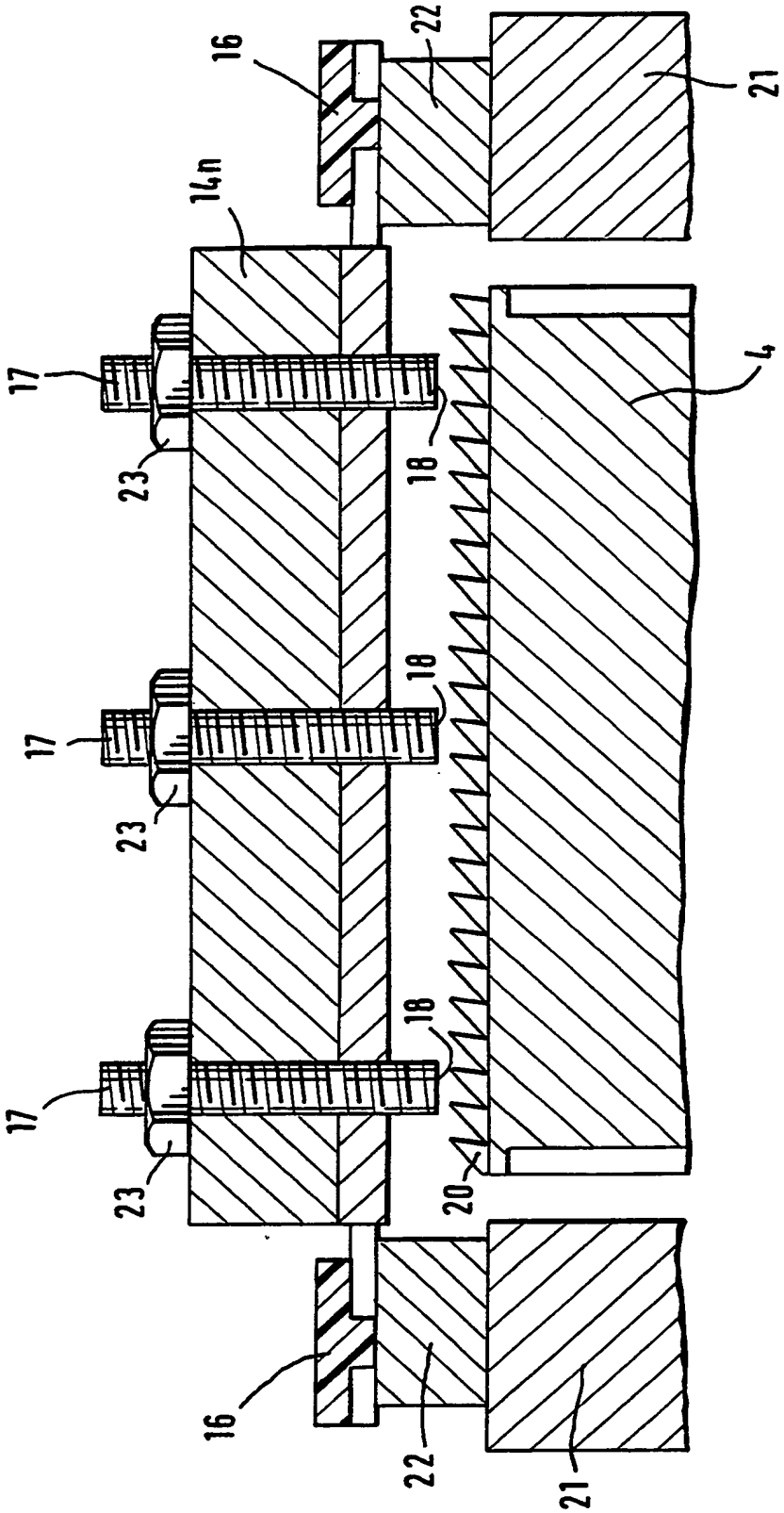


FIG. 3a

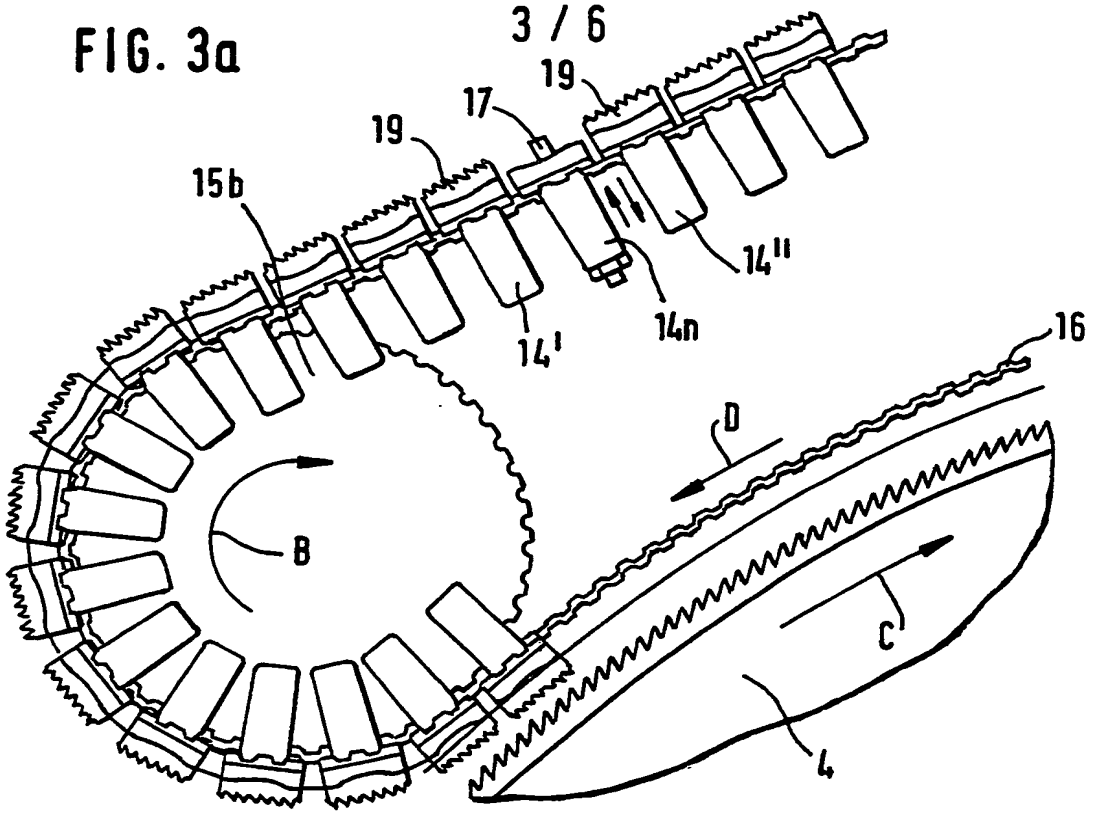
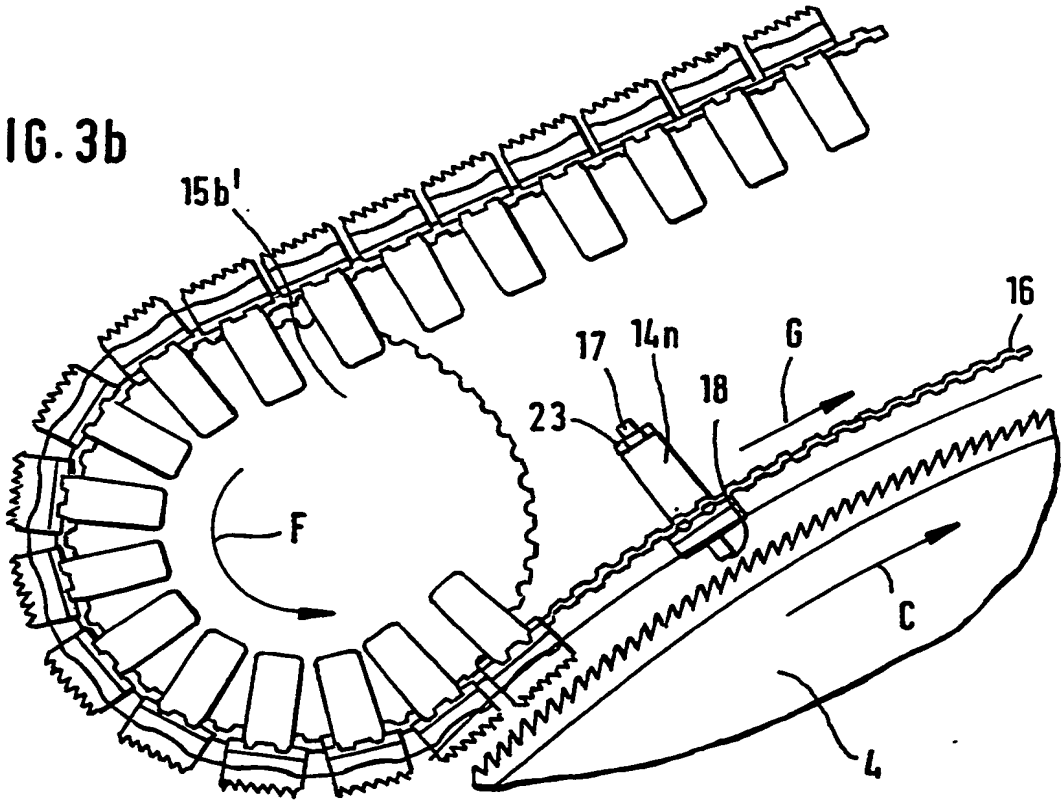


FIG. 3b



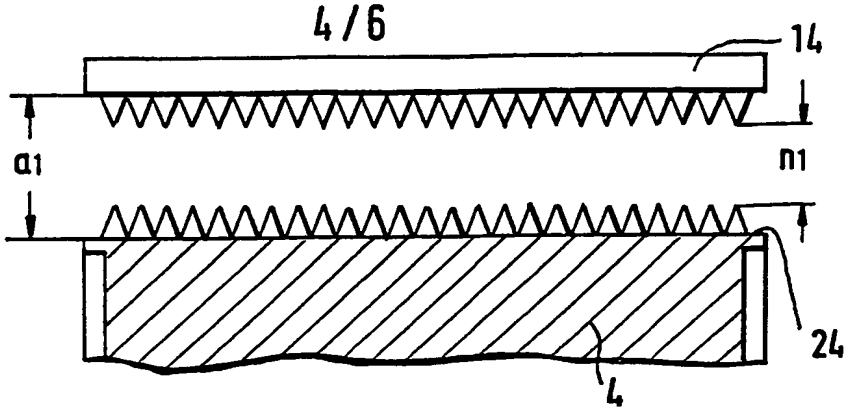


FIG. 4a

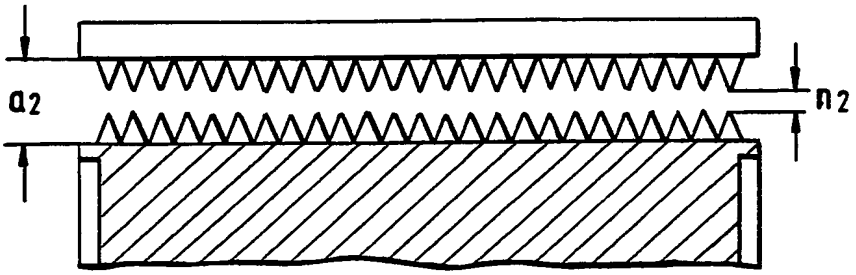


FIG. 4b

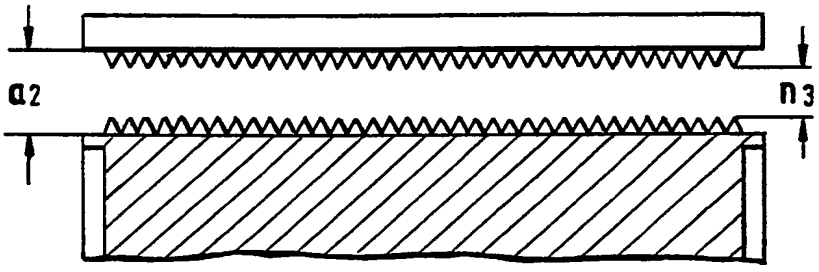


FIG. 4c

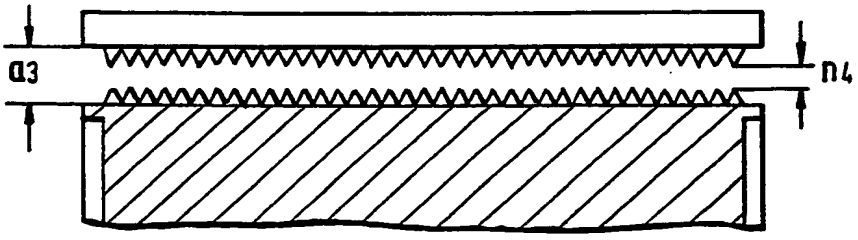


FIG. 4d

FIG. 5a

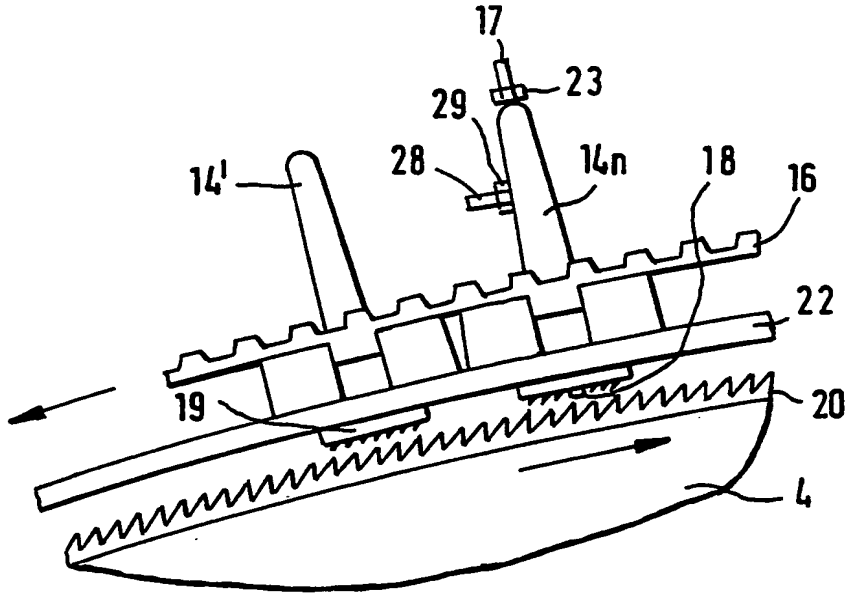


FIG. 5b

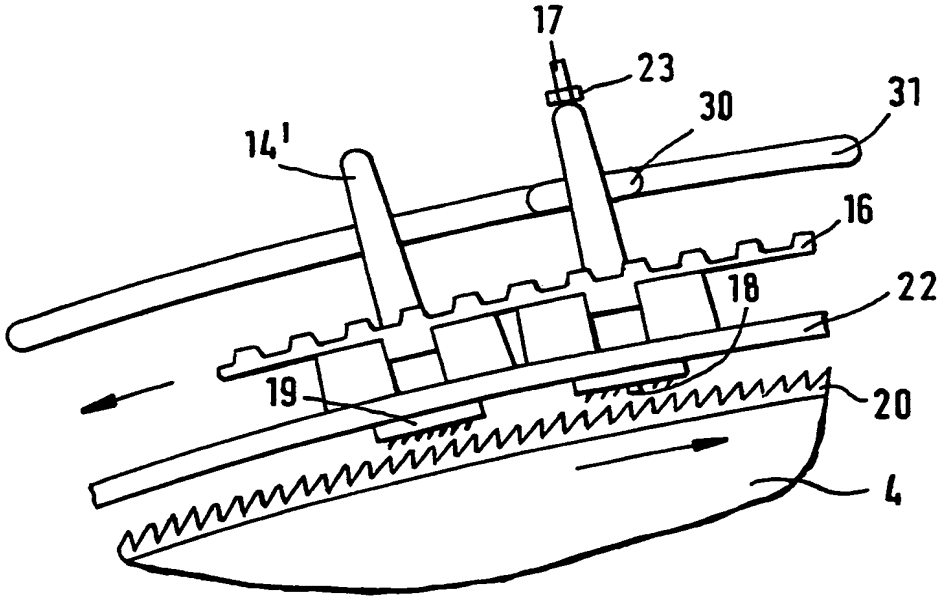
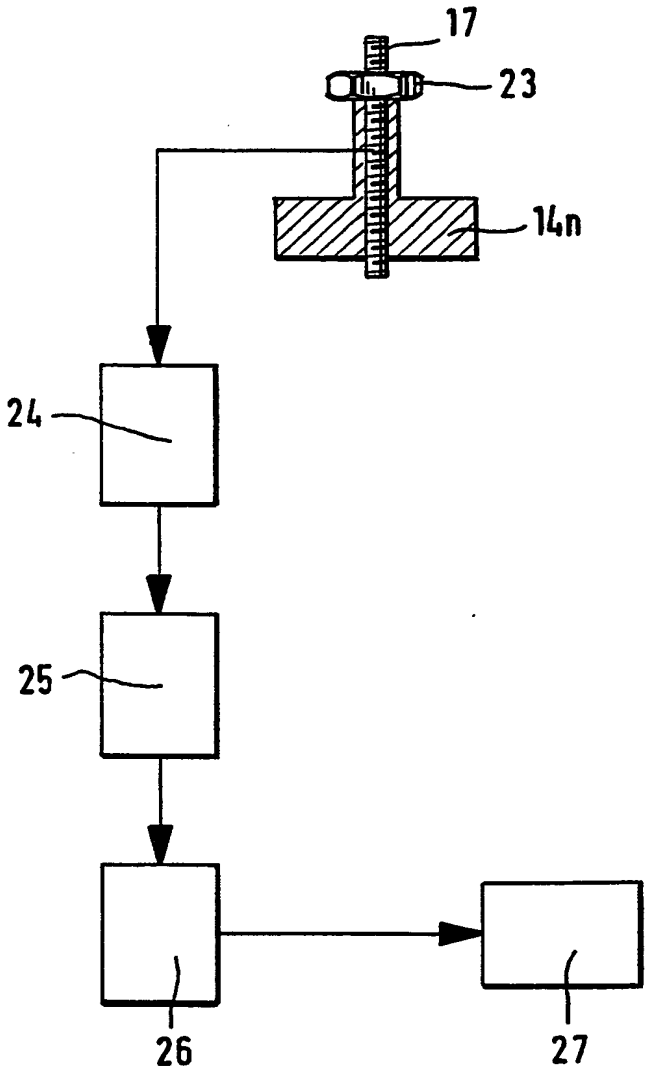


FIG. 6



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Measuring device in a spinning preparation machine

The invention relates to a device in a spinning preparation machine, for example a carding machine, a cleaner or the like, for measuring clearances at clothed parts, especially, for example, where a clothed cylinder cooperates with a counter-surface, for example a card top.

When a carding machine is being assembled, a specific clearance between the cylinder and the card tops, for example revolving card tops, is set manually by gauges. The clearance between the tips of the clothing of the cylinder and the tips of the clothing of the card tops is thereby set at the same time. Owing to centrifugal forces and thermal expansion, the clearance between the cylinders and the card tops, and therewith also the clearance between the tips of the clothings of the cylinders and the card tops, changes during operation. Allowance is routinely made for that change in the manual setting operation.

In a previously known device, provision is made for a probe to be present outside the clothing on at least one side of the cylinder during operation in order to check the existing or set clearance between the cylinder and the card tops lying opposite it. The clearance is always measured from the cylinder. On the card tops

opposite the cylinder, counter-members are arranged opposite the probes. When changes occur owing to centrifugal forces and thermal expansion during operation, the clearance between the probe and the counter-member becomes smaller, whereby the changed clearance between the cylinder and the card tops can be directly measured during operation with the known device. At all events, when a new clothing is being fitted, that is to say when there is no variation in the height of the tips of the clothings caused by wear, it is possible at the same time to infer indirectly a change in the originally set distance of the tips of the clothing of the cylinder from the tips of the clothing of the card tops. This device has the disadvantage that the actual clearance between the tips of the clothings after a prolonged running time of the machine cannot be measured during operation. The height of the tips of the clothings decreases owing to wear, so that the clearance between the cylinder and the card tops, on the one hand, and the clearance between the opposing tips of the clothings, on the other hand, become increasingly dissociated from each other after a prolonged running time. It is also troublesome that measurement of the change in the height of the tips of the cylinder clothing is not possible after a prolonged running time.

It is an aim of the invention to provide a measuring device that avoids the disadvantages mentioned and, in

particular, allows the clearance between the tips of the cylinder clothing and, for example, the tips of a card top clothing and/or the change in the height of the tips of the cylinder clothing after a prolonged running time of the carding machine to be measured during operation.

The present invention provides a measuring device for measuring clearance between a clothed cylinder and a counter-surface, comprising at least one sensor with which the tip clearance between the cylinder and the counter surface can be detected, the sensor being associated with the counter-surface and facing the clothing of the cylinder. The counter-surface is preferably a clothed counter-surface, for example a card top.

By assigning the sensor to the counter-surface, for example a surface of a card top, and so arranging it that it is facing the clothing of the cylinder, the clearance between the sensor and the clothing of the cylinder can be measured directly. In that manner, a change in the height of the tips of the clothings and, therewith, a change in the clearance of the clothings in the case of wear after a prolonged running period can be reliably measured during operation. The position of the sensor relative to the cylinder clothing allows direct measurement both of a change in the clearance and of a change in the height of the tips of the cylinder clothing.

The card top bar may be part of a revolving card top of a carding machine. The position of the card top may be fixed. Preferably, the sensor is arranged radially in relation to the cylinder. Advantageously, the sensor is adjustable in the radial direction. Advantageously, more than one sensor is present over the width of the card top. Preferably, the face of the sensor is arranged at the height of the tips of the card top clothing. Advantageously, the face of the sensor is arranged at a distance inward in relation to the height of the tips of the card top clothing. Advantageously, an inductive sensor is present. Preferably, the moving clothing of the cylinder lies opposite the sensor during operation. Preferably, the card top bar having the sensor can be installed and removed in continuous operation. Advantageously, the sensor is in communication with an electronic evaluation unit, for example a microcomputer. The sensor may be connected to the evaluation unit by wire. The sensor may instead be in cable-less communication with the evaluation unit. Advantageously, the sensor is connected to a memory for storing the measurements. Preferably, the measured clearance of the tips is used as the initial value of a regulating device for regulating the clearance between the card top and the cylinder. Preferably, the position of the flexible bend for the card top is adjustable. Preferably, the sensor is assigned to a part, for example a cover, a fixed carding

element or the like, that lies opposite the clothing of the cylinder.

Where the counter-surface is a revolving card top, the sensor may be assigned to an element that lies opposite the revolving card top. The element lying opposite may be a pivoted cross-arm. The cross-arm may be arranged in the region of one of the end guide rollers of a card top and in the region of the cylinder. The pivoted cross-arm having the sensor can advantageously be pivoted selectively towards the card top clothing or towards the cylinder clothing. The sensor may be arranged to move transversely. The sensor may be provided with a fine-pitch thread top for the height adjustment relative to the counter-surface.

The invention further provides a device in a spinning preparation machine, for example a carding machine, a cleaner or the like, for measuring clearances at clothings, in which a clothed cylinder co-operates with a clothed counter-surface, for example a card top, and in which there is at least one sensor with which the top clearance between the clothed surfaces can be detected, wherein the sensor is assigned to the card top and faces the clothing of the cylinder.

Moreover, the invention provides a method of measuring clearance between a clothed cylinder and a counter-surface in a textile machine, in which a card top bar comprising a sensor is installed and removed whilst

continuing operation of the textile machine, the clearance between the card top bar and the tips of the clothing of the cylinder and/or the clearance between the tips of the clothing of the card top bar and the tips of the clothing of the cylinder being determined by means of said sensor.

The present invention also provides a measuring device for determining the position of the tips of the clothing of a clothed part of a textile machine.

Certain illustrative embodiments of the invention will now be described in detail with reference to the accompanying drawings, of which:

Fig. 1 is a diagrammatic side view of a carding machine having a measuring device;

Fig. 2 is a cross-section of a measuring device with a sensor on a card top bar of a carding machine;

Fig. 3a, 3b show a measuring device having a sensor on a revolving card top of a carding machine;

Fig. 4a to 4d are diagrammatic views, partly in section, of a cylinder and a card top, showing the changing clearances between the card top and the cylinder and the respectively associated card top clothing and cylinder clothing;

Fig. 4a shows the clearance after assembly of the

carding machine;

Fig. 4b shows the clearance after brief operation;

Fig. 4c shows the clearance after prolonged operation;

Fig. 4d shows the clearance after regulation thereof;

Fig. 5a, 5b are side views of a device showing the signal transmission components; and

Fig. 6 is a block circuit diagram of a measuring device.

Figure 1 shows a carding machine, for example, of the type known as the EXACTACARD 740 and manufactured by Trützschler GmbH & Co. KG. The machine comprises a feed roller 1, a feed table 2, a licker-in 3, a cylinder 4, a doffer 5, a stripping roller 6, delivery rollers 7 and 8, a card web guiding element 9, a sliver funnel 10, calendar rollers 11, 12 and a revolving card top 13. The direction of rotation - arrow A, arrow B - of the front and rear end guide rollers 15a, 15b (sprocket wheels) of the card top is such that, in the vicinity of the cylinder, the direction of movement of the revolving card top is counter to the direction of rotation (arrow C) of the cylinder 4. The card top has card top bars 14', 14'', 14''' and 14n which (as shown in Figure 2) are drawn by double toothed belts 16 over a guide slide 22 located on the flexible bend 21 in the direction of the

arrow D (see Figure 1). On the upper side of the revolving card top, opposite the guide slide 22, the card top bars 14 are returned in the direction of the arrow E.

As will be seen from Figure 2, three sensors 17, which may be, for example, inductive sensors, are distributed over the length of the card top bar 14n, the face 18 of each sensor facing towards the cylinder clothing 20.

Figures 3a and 3b show the arrangement of the card top bar 14n having the sensor 17 between the card top bars 14' and 14'' which, like all the other bars, are provided with a card top clothing 19.

A fine-pitch thread top 23 at the rearward end of the sensor 17 (see Figure 2) allows precise adjustment of the position of the sensor face 18 relative to the clothing 19 of the card top. In Figure 3a, the card top rotates in the direction D, that is, in the vicinity of the cylinder, the direction of movement of the card top bars is counter to that of the cylinder. In contrast to the running direction D of the double toothed belt and hence the rotation of the front guide roller 15b of the card top in the clockwise direction shown in Figures 1, 2 and 3a, the revolving card top 13 shown in Figure 3b moves in the same direction as the cylinder 4, that is to say the front guide roller 15b' of the card top rotates in the anti-clockwise direction according to the arrow F. The double toothed belt 16, therefore, moves in the

direction G.

Figure 4 shows the two important dimensions a and n at different times. a is the clearance between the card top bar 14 and the surface 24 of the cylinder 4; n is the clearance between the card top clothing 19 and the cylinder clothing 20 or, more accurately, the clearance between the tips of the two clothings.

During assembly, the clearance A1 is set according to the particular requirements based on the tooth height, the throughput of fibre material and the revolution speed, which results in the tooth clearance n1 in the assembled state.

Figure 4b shows the clearances after a brief period of operation, taking into account the fact that the centrifugal forces occurring especially at the cylinder as a result of operation have caused the clearance to change. Owing to the rise in temperature to the operating temperature, expansion has also occurred; accordingly a2, just as n2, is less than it was in the assembly state. Since n2 is the desired clearance, however, that change must be taken into account from the outset during assembly.

After prolonged operation, as shown in Figure 4c wear occurs at the clothing. The clearance a2, to which the desired clearance n2 originally corresponded, has not changed, since no wear has occurred at the cylinder and the card top bars; the clearance between the tips of the

clothing of the cylinder and the tips of the clothing of the card top has, however, changed to n3. The clearance n3 is greater than the desired clearance n2 and, as shown in Figure 4d, is corrected by a clearance regulation operation to the value n4 which substantially corresponds to the value n2. As a result, the clearance a2 at the same time changes to a3. a3, therefore, is less than the original working clearance a2.

In an especially simple embodiment, shown in Figure 5a, the sensor 17 is inserted into a card top bar 14n and can be replaced by a normal card top bar 14' during the running of the machine. Since the speed of the card top bar is only 0.08 m/min, that replacement can be made without any difficulty. The card top bar 14n is equipped with a socket 29 into which a plug with a cable 28 can be inserted. The cable 28 is connected to a measuring means 24. Since the measurement is performed only when the sensor face 18 faces the cylinder clothing 20, the cable 28 is not plugged in until the sensor 17 has reached the measuring position.

In contrast to that embodiment, in which it is necessary to disconnect and re-connect the electrical contact when measurement is to be carried out repeatedly in the region of the flexible bend, Figure 5b shows, in the region of the flexible bend 21, a contact rail 31 which is fixed to the machine frame and with which the sensor 17 is in contact via the contact spring 30. As a

result, it is not necessary to re-make the contact since, in every revolution, the sensor is connected to the measuring device by means of the contact rail 31.

With reference to Figure 6, the measuring means 24 is in turn connected to a measurement indicator 25 which displays the values determined and transmits them to the carding machine control system 26 containing the memory. The carding machine control system 26 is then able to transmit signals to adjust the flexible curved element 21 in order suitably to adjust the clearance n or re-set it based on different operating conditions. That information is at the same time passed to the carding machine information system KIT, a computing and display unit 27, where the data of a complete set of carding machines are monitored.

The sensor 17 may be pivotably mounted, for example, in the region of the carding cylinder 4 and of one end of the revolving top. The sensor may be mounted, for example, on a cross-arm for pivotal movement between a first position in which it is able to determine the position of the tips of the clothing on a part of the revolving card top and a second position in which it is able to determine the position of the tips of the clothing on the carding cylinder. The sensor 17 may be so mounted that it is movable in the cross-machine direction.

Although the measuring device of the invention is

described above in relation to a carding machine, it may also be used to measure clearances of clothed surfaces in other textile machines, for example, cleaners.

Claims

1. A measuring device for measuring clearance between a clothed cylinder and a counter-surface, comprising at least one sensor with which the position of the tips of the clothing of the cylinder can be determined, the sensor being associated with the counter-surface and facing the clothing of the cylinder.

2. A device according to claim 1, in which the counter-surface is a surface of a card top.

3. A device according to claim 2, in which the card top is a revolving card top of a carding machine.

4. A device according to claim 2, in which the position of the card top is fixed.

5. A device according to any one of claims 2 to 4, in which the sensor is mounted on a card top bar.

6. A device according to any one of claims 2 to 5, in which more than one sensor is present over the width of the card top.

7. A device according to any one of claims 2 to 6, in which the sensor is so arranged that its sensing surface is substantially level with the tips of the card top clothing.

8. A device according to any one of claims 2 to 7, in which the sensing surface of the sensor is so positioned that the tips of the card top clothing project beyond it.

9. A device according to any one of claims 2 to 8, in which a card top bar comprising the sensor can be installed and removed whilst continuing operation of the cylinder and counter-surface.

10. A device according to any one of claims 2 to 9, in which the measured clearance of the tips is used as the baseline value of a regulating device for regulating the clearance between the card top and the cylinder.

11. A device according to any one of claims 2 to 18, in which the card top has a flexible bend, the position of which is adjustable.

12. A device according to any one of claims 1 to 11, in which the sensor is arranged radially in relation to the cylinder.

13. A device according to any one of claims 1 to 12, in which the sensor is adjustable in the radial direction.

14. A device according to any one of claims 1 to 13, in which an inductive sensor is present.

15. A device according to any one of claims 1 to 14, in which the moving clothing of the cylinder lies opposite the sensor during the measurement.

16. A device according to any one of claims 1 to 15, in which the sensor is in communication with an electronic evaluation unit, for example a microcomputer.

17. A device according to claim 16, in which the sensor is connected to cable means for passing the measured information to the evaluation unit.

18. A device according to claim 16, in which the sensor is in cable-less communication with the evaluation unit.

19. A device according to any one of claims 1 to 18, in which the sensor is connected to a memory for storing the measurements.

20. A device according to any one of claims 1 to 19, in which the sensor is assigned to a part, for example a cover, a carrying element or the like, that lies opposite the clothing of the cylinder.

21. A device according to any one of claims 1 to 20, in which the counter-surface is a part of a revolving card top and the sensor is assigned to an element that lies opposite the revolving card top.

22. A device according to claim 20 or claim 21, in which the element lying opposite is a pivoted cross-arm.

23. A device according to claim 22, in which the pivoted cross-arm is arranged in the region of one of the turn-around rollers of a card top and in the region of the cylinder.

24. A device according to claim 23, in which the pivoted cross-arm having the sensor can be pivoted selectively towards the card top clothing or towards the cylinder clothing.

25. A device according to any one of claims 1 to 24, in which the sensor is arranged to move transversely.

26. A device according to any one of claims 1 to 26, in which the sensor is provided with a fine-pitch thread top

for height adjustment relative to the counter-surface.

27. A measuring device substantially as described herein with reference to and as illustrated by any of Figure 1, Figure 2, Figure 3a, Figure 3b, Figures 4a to 4c, Figure 5a, Figure 5b and Figure 6.

28. A carding machine comprising a device according to any one of claims 1 to 27.

29. A device in a spinning preparation machine, for example a carding machine, a cleaner or the like, for measuring clearances at clothings, in which a clothed cylinder co-operates with a clothed counter-surface, for example a card top, and in which there is at least one sensor with which the tip clearance between the clothed surfaces can be detected, characterised in that the sensor is assigned to the card top and faces the clothing of the cylinder.

30. A method of measuring clearance between a clothed cylinder and a counter-surface in a textile machine, in which a card top bar comprising a sensor is installed and removed whilst continuing operation of the textile machine, the clearance between the card top bar and the tips of the clothing of the cylinder and/or the clearance between the tips of the clothing of the card top bar and the tips of the clothing of the cylinder being determined by means of said sensor.

31. A method according to claim 30, in which the card top bar comprises a plurality of sensors, the

clearance(s) being measured in the vicinity of each sensor.

32. A measuring device for measuring clearance between a clothed part and another part on a textile machine, comprising at least one sensor with which the position of the tips of the clothing of the clothed part can be determined.

33. A device according to claim 32, in which the said another part is also clothed.

34. A device according to claim 31 or claim 32, in which the sensor is associated with said another part.

35. A device according to claim 31 or claim 32, in which the sensor is associated with the clothed part.

36. A measuring device including a sensor for determining the position of the tips of the clothing of a clothed part of a textile machine.

37. A device according to claim 36, in which the sensor is pivotably mounted.

38. A device according to claim 37, in which the sensor is pivotably mounted in the region of a carding cylinder and of one end of a revolving card top which cooperates with the cylinder.

39. A device according to claim 38, in which the sensor is mounted for pivotal movement between a first position in which it is able to determine the position of the tips of the clothing on a part of the revolving card top and a second position in which it is able to determine the

position of the tips of the clothing on the carding cylinder.

40. A device according to any one of claims 36 to 39, in which the sensor is mounted for movement in the cross-machine direction.

Patents Act 1977 Examiner's report to the Comptroller under Section 17 (The Search report) -19-	Application number GB 9321763.6
Relevant Technical Fields (i) UK Cl (Ed.L) D1N (ii) Int Cl (Ed.5) D01G 15/08, 15/28	Search Examiner T W RICHENS Date of completion of Search 14 DECEMBER 93
Databases (see below) (i) UK Patent Office collections of GB, EP, WO and US patent specifications. (ii)	Documents considered relevant following a search in respect of Claims :- 1-40

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A:	Document indicating technological background and/or state of the art.	&:	Member of the same patent family; corresponding document.

Category	Identity of document and relevant passages		Relevant to claim(s)
X	WO 79/00983 A1	(REITER) page 12 lines 4-15	32,36
X	US 5040272	(FRIZSCHE) Claim 1	32,36

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